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October 25, 2010

Steve Way
On-Scene Coordinator
U.S. Environmental Protection Agency, Region 8
Mail Code: 8EPA-SA
1595 Wynkoop Street
Denver, Colorado 80202-1129

SUBJECT: START 3, EPA Region 8, Contract No. EP-W-05-050, TDD No. 1008-01 Field Sampling Plan, Red and Bonita Mine, Silverton, San Juan County, Colorado

Dear Steve:

Attached are two copies of the draft Field Sampling Plan for the Red and Bonita Mine in Silverton, San Juan County, Colorado. Field activities are anticipated to be conducted in late October or early November 2010. This document is submitted for your approval.

If you have any questions, please call me at 303-291-8269

Yours sincerely,

URS OPERATING SERVICES, INC.

Andrew Longworth
Project Manager

cc: Charles W. Baker/UOS (w/o attachment)
Andrew Longworth/UOS
File/UOS

START 3

Superfund Technical Assessment and Response Team 3 - Region 8

United States
Environmental Protection Agency
Contract No. EP-W-05-050

FIELD SAMPLING PLAN

RED AND BONITA MINE
Silverton, San Juan County, Colorado

TDD No. 1008-01

OCTOBER 25, 2010

URS
OPERATING SERVICES, INC.

In association with:
Garry Struthers Associates, Inc.
LT Environmental, Inc.
TechLaw, Inc.
Tetra Tech EM, Inc.
TN & Associates. Inc.

FIELD SAMPLING PLAN

RED AND BONITA MINE
Silverton, San Juan County, Colorado

EPA Contract No. EP-W-05-050
TDD No. 1008-01

Prepared By:
Andrew Longworth
Project Manager

URS Operating Services, Inc.
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Approved: ______________________ Date: 11/22/10
Steve Way, On-Scene Coordinator, EPA, Region 8

Approved: ______________________ for Date: 10/25/10
Charles W. Baker, START 3 Program Manager, UOS

Approved: ______________________ Date: 10/22/10
Andrew Longworth, START 3, UOS

DISTRIBUTION LIST

U.S. ENVIRONMENTAL PROTECTION AGENCY

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FIELD SAMPLING PLAN
for
Removal Assessment

Red and Bonita Mine
Silverton, San Juan County, Colorado

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1.0 INTRODUCTION

URS Operating Services, Inc. (UOS) has been tasked by the U.S. Environmental Protection Agency (EPA), under the EPA Region 8 Superfund Technical Assessment and Response Team 3 (START) Contract No. EP-W-05-050, to conduct a removal assessment (RA) at the Red and Bonita Mine (CERCLIS ID# CON000802811) in Silverton, San Juan County, Colorado. Field work for this RA is projected to be completed during late October or early November 2010.

This Field Sampling Plan (FSP) is designed to guide field operations during the RA, and has been prepared in accordance with Technical Direction Document (TDD) #1008-01 and the "UOS Generic Quality Assurance Project Plan" (QAPP) (UOS 2008). The RA field work will include sampling and non-sampling data collection. UOS START plans to sample surface water from Cement Creek and discharge water coming from the adits on site, including American Tunnel, Red and Bonita Mine, Gold King #7 Mine, Mogul Mine, and Grand Mogul Mine. Sampling procedures will adhere strictly to those outlined in the UOS Technical Standard Operating Procedures (TSOPs) for field operations at hazardous waste sites (UOS 2005).

Site characterization samples will potentially include 10 surface water samples and 1 field Quality Assurance/Quality Control (QA/QC) duplicate sample (Table 1). The QA/QC samples will follow the requirements of the "Guidance for Choosing a Sampling Design for Environmental Data Collection" (EPA 2002).

All samples will be analyzed through a private contracted laboratory for special analyses.

2.0 OBJECTIVES

The purpose of this RA is to gather information regarding sources of discharge in the Upper Cement Creek area. The specific objective of this RA is:

- To assess similarities among adit releases, through Tritium and stable isotope analysis, before response actions in the upper Cement Creek watershed. Samples will be collected from surface water and mine water for analysis.

3.0 BACKGROUND INFORMATION

3.1 SITE LOCATION AND DESCRIPTION

Cement Creek originates high in the rugged San Juan Mountains of southwestern Colorado near the San Juan County and Ouray County line on the south slopes of Red Mountain Number 3 and the north slopes of Storm Peak. Cement Creek begins at an elevation of 13,000 feet above mean sea level (MSL) and flows 7 miles southward to an elevation of 9,305 feet above MSL at its confluence with the Animas River at Silverton, Colorado (Figures 1 and 2) (Colorado Department of Public Health and Environment [CDPHE] 1998). The name Cement Creek probably refers to the iron rich precipitates (ferricrete) that coat and cement the stream bed materials (Photos 1 and 2) (U. S. Geological Survey [USGS] 2007e). This investigation will focus on the Upper Cement Creek (above Gladstone) including American Tunnel Mine, Gold King #7 Mine, Red and Bonita Mine, Mogul Mine, and Grand Mogul Mine.

3.2 SITE HISTORY AND PREVIOUS WORK

3.2.1 Mining Activities

The rugged and relatively inaccessible western San Juan Mountains were first prospected by the Baker party, which explored the area around Silverton in 1860. After a treaty with the Ute Indians was revised, mining began in 1874, and George Green brought the first smelter equipment into the area at Baker's Park that year (Silverton Magazine 2009). The extension of the railroad from Silverton up Cement Creek to Gladstone in 1899 encouraged the mining of low grade ores, and the establishment of a lead-zinc flotation plant in 1917 allowed for the treatment of the low grade complex ores found in the area (USGS 1969). The last producing mine in the area was the Sunnyside Mine, which ceased production in 1991 (USGS 2007c). The closing of the Sunnyside mine occurred after Lake Emma drained into the mine and out the American Tunnel into Cement Creek in 1978. The flood water from the Lake Emma "blow-out" was reported to have flowed down Cement Creek in a 10-foot wall of water that would have transported a large quantity of tailing and other mine waste down Cement Creek to the Animas River (The Silverton Railroads 2009).

Over a 100-year period between 1890 and 1991, mining activities in the Upper Animas River Basin, including Cement Creek, produced the waste rock and mill tailings sources from which contamination spread throughout the surface water pathway. Over 18 million tons of ore were mined from the Upper Animas River Basin area, with more than 95 percent of this being dumped directly into the Animas River and its tributaries in the form of mill waste. Older waste rock piles and stope fillings were reworked and sent to mills as technology allowed lower grade ores to be processed economically. A great deal of abandoned waste was also milled during World War II when many older mining and milling structures were cannibalized for scrap metal. The history of mining and milling in the Cement Creek area can be divided into four eras, each of which produced different types and volumes of mine wastes.

- Phase 1 The Smelting Era (1871-1889). Mines were usually small, mining was done by hand, milling was rarely done, and small amounts of often highly mineralized rock were left in surface dumps. Zinc minerals were preferentially removed from the ore and left in mine dumps because zinc created problems during the smelting process. Total production of the entire Upper Animas River area during this era is estimated to be 93,527 short tons. Very little mine or mill tailings were directly discharged into the area streams (USGS 2007c).

- Phase 2 The Gravity Milling Era (1890-1913). Federal Government support coupled with the introduction of higher capacity mining and milling techniques encouraged the mining of lower grade ores. Milling became the predominant ore processing method as ore values dropped and tonnage increased. Large volumes of mine and milling wastes were discharged directly into streams. Gravity mills recovered as much as 80 percent of the metals; however, zinc, iron pyrite, and some copper compounds were not recoverable, and when discharged into the streams, were easily spread downstream throughout the environment. Between 1890 and 1913 the total production of the entire Upper Animas River area was estimated at 4.3 million short tons (USGS 2007c). Approximately 95 percent of the waste generated during this era was discharged directly into the area streams (USGS 2007c).

- Phase 3 The Early Flotation Era (1914-1935). The increased demand for metals caused by World War I further accelerated the trend to larger scale mining and milling in the area. Ball mill grinding and froth flotation for concentrating ores were introduced, and again most mill tailings were dumped directly into area streams. During this era total production of the entire Upper Animas River area was estimated at 4.2 million short tons, of which only 36,232 short tons were shipped out of the area to be smelted (USGS 2007c).

- Phase 4 The Modern Flotation Era (1936-1991). Mining almost came to a halt during the Great Depression, but mining activity resumed during World War II when many mines and mills were reopened with substantial support from the Federal Government. In addition to the newly mined material, waste rock from abandoned mines, in both the waste dumps and the old underground stope fills, was reclaimed and processed. Mining and milling processes improved in detail, but still used familiar technology. The major change was the impoundment of mill tailings that began as a result of a 1935 Colorado Supreme Court ruling that required operations to contain mill tailings. Some early attempts to contain mill tailings were not completely successful and resulted in catastrophic releases of mill tailings to area streams. Mining and milling in the Upper Animas River area had substantially decreased by 1953, and all mining and milling activity ceased in 1991. During this era total production of the entire Upper Animas River area was estimated at 9.5 million short tons. All mill tailings were impounded in settling ponds except for an estimated 200,000 short tons of mill tailings that were released into the Animas River area streams. Ore shipments to smelters totaled only 8,148 tons out of the 9.5 million short tons of production during this final era (USGS 2007c).

Reclamation activities have been ongoing in the Cement Creek basin since 1991 when tailings were removed from the Lead Carbonate Mill site. Remediation work has also been conducted in Gladstone at the American Tunnel waste dump, Mayflower Mill, Gold King #7 Level Mine, Galena Queen, Hercules Mine, Henrietta Mine, and most recently at the Joe and John Mine and the Lark Mine in 2006 and 2007 (Animas River Stakeholders Group [ARSG] 2007). No new reclamation activities have been initiated in 2008 or 2009 (ARSG 2009).

3.2.2 Summary of Previous Environmental Assessment Work

- March 1995 — *Reconnaissance Feasibility Investigation Report of the Upper Animas River Basin.* Colorado Division of Minerals and Geology. J. Herron, B. Stover, P. Krabacher, and D. Bucknam.
- October 1995 — *Animas Discovery Report – Upper Animas River Basin.* CDPHE – Hazardous Materials and Waste Management Division. Camille Farrell.
- February 1997 — *Water Quality and Sources of Metal Loading to the Upper Animas River Basin.* CDPHE – Water Quality Control Division. J. Robert Owen.
- July 1997 — *Sampling and Analysis Plan for a Site Inspection of the Upper Animas Watershed, Silverton Mining District, San Juan County, Colorado.* CDPHE – Hazardous Materials and Waste Management Division. Camille Farrell.
- April 1998 — *Analytical Results Report, Cement Creek Watershed, San Juan County, Colorado.* CDPHE Hazardous Materials and Waste Management Division. Camille Farrell. Five ground water, 6 surface water, 53 sediment, and 15 source samples collected in 1996. Data validation reports are not available. These data are not usable for a HRS evaluation of the site because sample locations are not documented and data validation cannot be documented.
- September 1998 — *Cement Creek Reclamation Feasibility Report, Upper Animas River Basin.* Colorado Division of Minerals and Geology. Jim Herron, Bruce Stover, and Paul Krabacher. Forty waste rock locations and four soil locations in the Cement Creek drainage

were sampled by collecting a liquid extract of the rock or soil material from 10 to 20 aliquots at each location. These data are not usable for a HRS evaluation of the site because the analytical results are for extracts from composite samples.

- March 1999 — *Site Inspection Analytical Results Report for the Upper Animas Watershed, San Juan County, Colorado.* CDPHE – Hazardous Materials and Waste Management Division. Camille Farrell. Samples of mine waste rock, seeps, surface water, and sediment collected in 1997. Exact locations of samples were not documented. Photographs of sample locations are available. Data validation reports are not available. These data are not usable for an HRS evaluation of the site because sample locations are not documented and data validation cannot be documented.

3.3 SITE CHARACTERISTICS

3.3.1 Physical Geography

The areas under investigation are located north to northwest of the town of Silverton, Colorado.

3.3.2 Geology

The Cement Creek basin is located in the volcanic terrain of the San Juan Mountains. The area was a late Oligocene volcanic center that witnessed the eruption of many cubic miles of lava and volcanic tuffs that covered the area to a depth of more than a mile (USGS 1969). The formation of the 10-mile diameter Silverton caldera produced faults that are generally concentric circular features. The caldera collapse was followed by multiple episodes of hydrothermal activity that produced widespread alteration and mineralization of the rocks (USGS 2007a). Cement Creek flows through the middle of the old Silverton caldera (EPA 1999).

The predominant rock type found in the Cement Creek Basin is the Oligocene Age Silverton Volcanics. The Silverton Volcanics are lava flows of intermediate to silicic composition and related volcaniclastic sediments that accumulated to a thickness of approximately 1,000 feet around older volcanoes prior to the subsidence of the Silverton Caldera (USGS 2002).

The regional propylitization of the rocks in the area prior to the collapse of the calderas created an altered regional rock type that contains significant amounts of calcite ($CaCO_3$), epidote ($Ca_2Fe(Al_2O)(OH)(Si_2O_7)(SiO_4)$), and chlorite ($(MgFeAl)_6(SiAl)_4O_{10}(OH)_8$), all of which contribute to the intrinsic acid-neutralizing capacity of the major regional rock type. Three major areas of post-caldera collapse mineralization and alteration have been identified in the Cement Creek drainage. The Ohio Peak-Anvil Mountain (OPAM) area on the west side of the lower Cement Creek drainage and the Red Mountains area on the northwest side of the upper Cement Creek drainage are both sites of 23-million-year-old acid-sulfate mineralization. The Eureka Graben area on the upper northeast side of the Cement Creek drainage is the site of 8- to 10-million-year-old emplacement of northeast-trending polymetallic veins of silver, lead, zinc, copper, and often gold that formed as fracture or fissure filling material (USGS 2007d).

The Red Mountain and OPAM acid-sulfate hydrothermal systems cover 4.5 square miles and 4.1 square miles, respectively, along the margin of the collapsed Silverton Caldera on the west and northwest side of the Cement Creek Drainage. Most of the mineralization and mining activity in these two areas have occurred in the Red Mountain area with mines and adits related to the Red Mountain acid-sulfate system found in Prospect, Dry, Georgia, and Corkscrew Gulches, all tributaries of Cement Creek. The ores from these mines commonly contain enargite (Cu_3AsS^4), galena (PbS), chalcocite (Cu_2S), tetrahedrite ($(Cu,Fe)_{12}(Sb,As)_4S_{13}$), stromeryite ($AgCuS$), bornite ($Cu_5FeS_4$), chalcopyrite ($CuFeS_2$), and pyrite ($FeS_2$) along with elemental arsenic (As), copper (Cu), lead (Pb), and iron (Fe) (USGS 2007d).

Mineralization in the veins of the Eureka Graben that is drained by upper Cement Creek include massive pyrite and milky quartz (FeS_2—$Si0_2$), chalcopyrite ($CuFeS_2$), galena (PbS), sphalerite (ZnS), fluorite (CaF), and elemental gold (Au), and silver (Ag) (USGS 2007d).

The San Juan Mountains were nearly covered by alpine glaciers during the latest Pleistocene Pinedale glaciation. The thickness of glacial ice is estimated to have ranged from approximately 1,400 feet thick at Gladstone to 1,700 feet thick at Silverton. The

Pinedale glaciation ended approximately 12,000 years ago, and except for the glacial till deposits, all surface sediments along Cement Creek were likely deposited after that date (USGS 2007e). Approximately 6,000 years ago, Cement Creek cut into the creek bed sediments by as much as 16 feet, causing a drop in the valley bottom shallow water table aquifer. Beginning about A.D. 400, Cement Creek aggraded the stream bed by as much as 10 feet, then between A.D. 1300 and A.D. 1700, Cement Creek cut back to the previous level established approximately 6,000 years ago. These changes in the shallow water table elevations in the valley caused mineralization and cementation of the sediments in the stream course (USGS 2007e).

Recent human activities have had relatively little influence on the overall shape and physical processes of Cement Creek (USGS 2007e).

3.3.3 Hydrogeology

Groundwater in the Cement Creek area is found in cracks and fissures in the near surface of the igneous rocks that comprise the majority of the area.

3.3.4 Hydrology

The drainage area of Cement Creek is 20.1 square miles (USGS 2007b). Cement Creek flows through the middle of the old caldera, with the period of high flow being May, June, and July, in response to snowmelt in the San Juan Mountains, and the periods of low flow occurring in late winter and late summer (EPA 1999). The average flow measured by the USGS on Cement Creek at Silverton before the confluence with the Animas River at station number 09358550 between 1992 and 2008 (excluding 1994) was 38.3 cubic feet per second (cfs). The highest average flow on Cement Creek was 56.3 cfs during 1995 and the lowest was 17 cfs during the drought of 2002 (USGS 2009). The drainage area of the Animas River is 146 square miles (USGS 2007b). The average flow measured by the USGS on the Animas River below Silverton at station number 09359020 between 1992 and 2008 was 281 cfs (USGS 2009).

3.3.5 Meteorology

The Red and Bonita Mine site is located in an alpine climate zone. The mean annual precipitation is about 40 inches. Winter snowfall is heavy, and severe rain storms occur in the summer (USGS 1969). The average total precipitation for Silverton, Colorado as totaled from the Western Regional Climate Center database is 24.50 inches. The 2-year, 24-hour rainfall event for this area is 2 inches (National Oceanic and Atmospheric Administration [NOAA] 1973).

3.4 CONCEPT OF OPERATIONS

3.4.1 Schedule

Field work is scheduled for October 2010. Sampling is estimated to be completed in approximately 1 day. Non-sampling data collection will be performed as appropriate.

3.4.2 Safety

All field activities will be conducted in strict accordance with an approved UOS Site Health and Safety Plan, which will be developed before the start of field activities. It is anticipated that all field work can be accomplished in Level D personal protective equipment.

3.4.3 Site Access and Logistics

UOS will obtain site access with the assistance, if necessary, of the EPA Region 8 Site Assessment Manager for this site. UOS will have written consent from all applicable property owners (on site and off-site) prior to the field sampling event.

3.5 SAMPLE LOCATIONS

This sampling event involves the collection of 3 surface water and 5 mine water samples as shown in Figure 2 (Tables 1 and 2). All sample points will be located on a topographic map or with a Global Positioning System (GPS) device after sample collection. This procedure will allow documentation of changes in sample locations as they occur in the field due to unanticipated site conditions.

Potential surface water samples will be collected from Cement Creek above Grand Mogul Mine and above Mogul Mine. Mine water samples will be collected from adits at American Tunnel, Gold King #7 Mine, Red and Bonita Mine, Mogul Mine; from North Fork above Gold King #7 Mine, and at the toe of a waste pile at Grand Mogul Mine.

3.6 SAMPLING METHODS

3.6.1 Surface Water and Mine Water Sampling

UOS will measure field parameters, including pH, temperature and electrical conductivity, of each sample collected as described in TSOP 4.14 "Water Sample Field Measurements." All data will be recorded on appropriate sample forms. Sampling will be conducted from the farthest downstream location to the farthest upstream location to minimize the potential for cross-contamination. Two types of surface water sample collection will be implemented at each sampling location.

Stable Water Isotope Sample Collection

Stable water isotope samples should be collected in two 30-milliliter (mL) borosilicate glass vials with airtight caps. The container must be certified clean. Alternatively two 15-30-mL high density polyethylene (HDPE) bottles may be used if glass containers are at risk of breaking in the field during sampling. HDPE containers may be filled until full. Container should not be pre-rinsed before sampling. No preservation or filtration is necessary. Glass bottles should be filled two-thirds full with sample water to allow for sample to freeze without bottle breakage. After sample collection, bottle cap should be sealed with Parafilm or tape to avoid evaporation and interaction with ambient air. Samples should be stored on ice or frozen in HDPE containers immediately after collection. All sampling locations should be documented in the logbook and photographed.

3.6.1.2 Tritium Sample Collection

Tritium water samples should be collected in two 1-Liter glass containers with air tight caps. The container must be certified clean. Alternatively, two 1-Liter HDPE bottles may be used if glass containers are at risk of breaking in the field during sampling. Container should not be pre-rinsed before sampling. No preservation or filtration is necessary. Bottle should be completely filled, avoiding any air bubbles in the container. A peristaltic pump may be if water source is not of sufficient depth to fill the bottle directly, and dedicated tubing will be used if this is the case. The bottle should be inverted to check for air bubbles. After sample collection, bottle cap should be sealed with Parafilm or tape to avoid evaporation and interaction with ambient air. Samples can be stored at ambient temperature. All sampling locations should be documented in the logbook and photographed.

3.7 CONTROL OF CONTAMINATED MATERIALS

Investigation-derived waste (IDW) generated during the sampling event will be handled in accordance with UOS TSOP 4.8, "Investigation-Derived Waste Management," and the OERR Directive 9345.3-02, "Management of Investigation-Derived Waste During Site Inspections," May 1991 (UOS 2005; EPA 1991).

3.8 ANALYTICAL PARAMETERS

Table 2, the Sample Plan Checklist, lists all sample parameters.

3.8.1 <u>Laboratory Analytical Parameters</u>

All samples will be analyzed for stable water isotopes by the University of Colorado. Samples will be analyzed for Tritium by the USGS.

4.0 <u>CHAIN OF CUSTODY</u>

After sample collection and identification, all samples will be handled in strict accordance with the chain-of-custody protocol specified in UOS TSOP 4.3, "Chain of Custody" (UOS 2005).

5.0 <u>MEASUREMENT QUALITY OBJECTIVES</u>

5.1 FIELD QUALITY CONTROL PROCEDURES

All samples will be handled and preserved as described in UOS TSOP 4.2, "Sample Containers, Preservation, and Maximum Holding Times." Calibration of the pH, temperature, and conductivity meters will follow instrument manufacturers' instruction manuals and UOS TSOP 4.14, "Water Sample Field Measurements." Sample collection will progress from downstream to upstream to prevent cross-contamination (UOS 2005).

All non-disposable, pre-cleaned sampling equipment will be decontaminated before and after use in accordance with UOS TSOP 4.11, "Equipment Decontamination." Basic decontamination will consist of washing or brushing gross particulate off sampling equipment with tap water and a scrub brush, followed by washing equipment with a solution of Liquinox and distilled water, and rinsing with distilled water. After decontamination, the equipment will be allowed to gravity drain (UOS 2005).

The following sample will be collected to evaluate quality assurance at the site in accordance with the UOS Generic QAPP (UOS 2008):

- One duplicate surface water sample per set of 20 samples collected. One will be required for this site.

The UOS Generic QAPP serves as the primary guide for the integration of QA/QC procedures for the START contract (UOS 2008).

5.2 DATA QUALITY INDICATORS

Data quality assessment to determine data quality and usability will include:

- A QA/QC review of field-generated data and observations;
- Individual data validation reports for all sample delivery groups;
- Review of the procedures used by the validator to qualify data for reasons related to dilution, reanalysis, and duplicate analysis of samples;
- Evaluation of QC samples such as field replicates and laboratory control samples to assess the quality of the field activities and laboratory procedures;
- Assessment of the quality of data measured and generated in terms of accuracy, precision, and representativeness; and
- Summary of the usability of the data, based upon the assessment of data conducted during the previous steps.

5.2.1 Bias

Bias is systematic or persistent distortion of a measurement process that causes errors in one direction. The extent of bias can be determined by an evaluation of laboratory initial calibration/continuing calibration verification, laboratory control spike/laboratory control spike duplicates, blank spike, and Method Blank.

Bias will be controlled at the Upper Cement Creek sites by the laboratory.

5.2.2 Precision

Precision is the measure of agreement among repeated measurements of the same property under identical, or substantially similar, conditions and is expressed as the relative percent difference between the sample pairs.

At the mine sites, precision will be attained by comparing the duplicate sample from the mine and surface water sampling.

5.2.3 Representativeness

Representativeness is the measure of the degree to which data accurately and precisely represent a characteristic of a population parameter, variations at a sampling point, a process condition, or an environmental condition. Representativeness encompasses both the degree to which measurements reflect the actual concentration, and the degree to which sampling units reflect the population they represent. The effect of representativeness should be considered on two levels: within the sample unit and between sample units. Aspects of representativeness include adherence to TSOPs for sampling procedures, field and laboratory QA/QC procedures, appropriateness of sample material collected, compositing to increase sample representativeness, homogenization, analytical method and sample preparation, and achievement of measurement quality objectives (MQO) for the project.

During sample collection at the Upper Cement Creek sites, TSOPs will be strictly adhered to so that data are precise and accurate.

5.2.4 Completeness

Completeness is a measure of the amount of valid data obtained from a measurement system. The actual percentage of completeness is less important than the effect of completeness on the data set.

5.2.5 Comparability

Comparability is the qualitative term that expresses the confidence that two data sets can contribute to common interpretation and analysis and is used to describe how well samples within a data set, as well as two independent data sets, are interchangeable.

Results obtained from mine and surface water sampling at sites will be used to determine discharge sources by comparing stable isotope dates from the respective surface water samples. It is important that sampling technique and laboratory analysis are correct so that comparison is accurate.

6.0 DATA QUALITY ASSESSMENT AND REPORTING

Data will be supplied to EPA for analysis.

7.0 LIST OF REFERENCES

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N

0 1 2 4 Miles

TDD Title: **Red and Bonita**

Figure Title: Site Location

Figure No. 1

TDD State: CO

TDD County: SAN JUAN

TDD: 1008-01

Date: 10/2010

Base Data Source: USGS Topo

Datum/Projection: NAD 1983 Zone 13N UTM

Rev 0 05/2010

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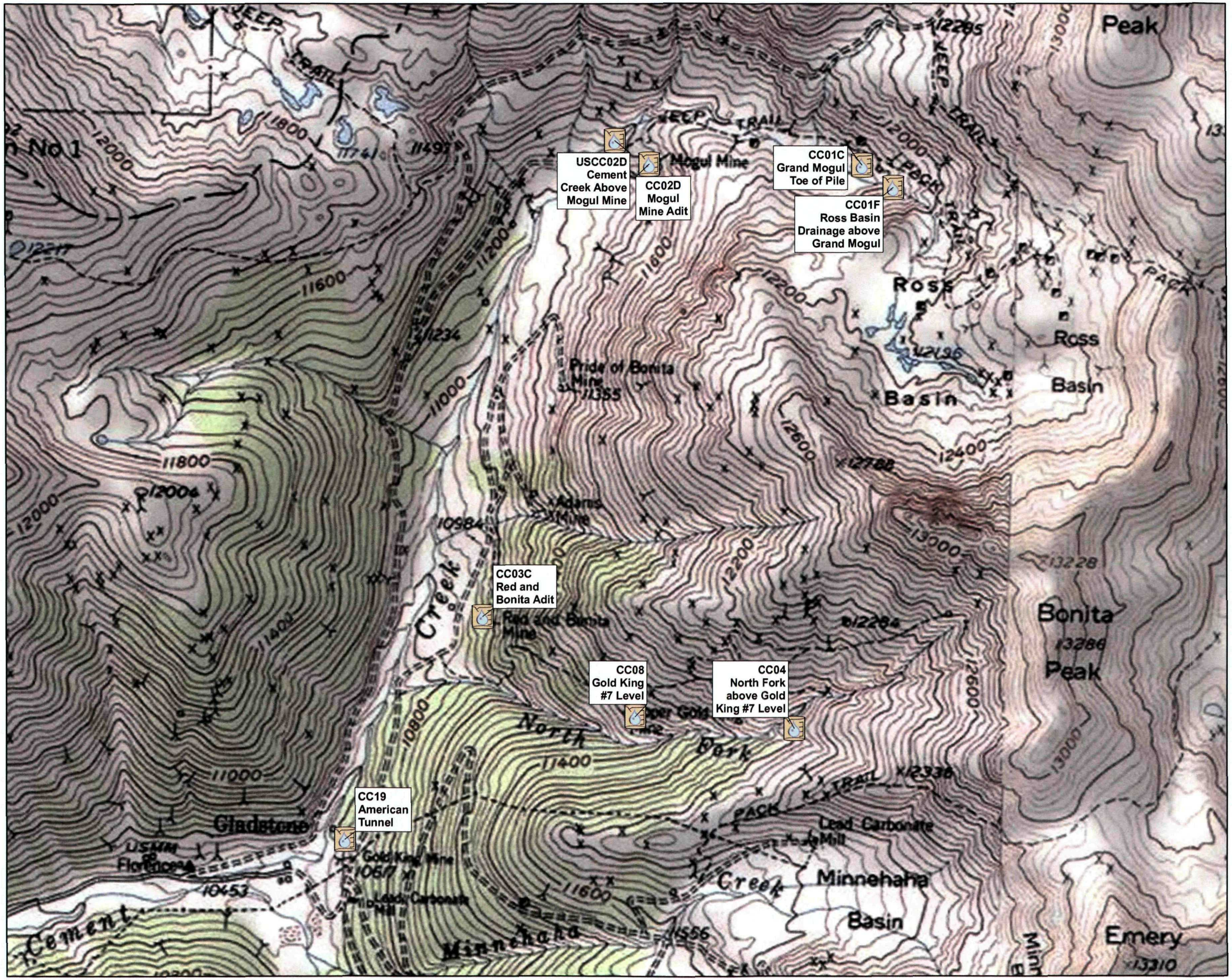

Legend

Potential Isotope Sampling Locations

N

0 500 1,000 2,000 Feet

TDD Title: **Red and Bonita**

Figure Title: Sample Locations

Figure No. 2

TDD State: CO

TDD County: SAN JUAN

TDD: 1008-01

Date: 10/2010

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Datum/Projection: NAD 1983 Zone 13N UTM

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TABLE 1
Sample Locations and Rationale

Matrix	Sample #	Location	Rationale
Mine Water	CC01C	To be collected from the toe of the waste pile at Grand Mogul Mine.	Determine the age of the water by stable isotope and tritium analysis.
Surface Water	CC01F	To be collected from the Ross Basin Drainage above Grand Mogul.	
Mine Water	CC02D	To be collected from adit at Mogul Mine.	
Surface Water	USCC02D	To be collected from Cement Creek above Mogul Mine.	
Mine Water	CC03C	To be collected from the adit at Red and Bonita Mine.	
Mine Water	CC04	To be collected from North Fork above Gold King #7 Level Mine.	
Mine Water	CC08	To be collected from Gold King #7 Level Mine.	
Mine Water	CC19	To be collected from American Tunnel Mine.	
QA/QC	CC20	To be determined in field.	

TABLE 2
Sample Plan Checklist

Sample Location	Sample Type	Field Parameters			Analysis			Quality Control Samples		
		Temp	pH	Cond	Stable Water Isotopes - H	Stable Water Isotopes - O	Tritium	Dup	Spike	Blank
CC01C	Mine Water	X	X	X	X	X	X			
CC01F	Surface Water	X	X	X	X	X	X			
CC02D	Mine Water	X	X	X	X	X	X			
USCC02D	Surface Water	X	X	X	X	X	X			
CC03C	Mine Water	X	X	X	X	X	X			
CC04	Surface Water	X	X	X	X	X	X			
CC08	Mine Water	X	X	X	X	X	X			
CC19	Mine Water	X	X	X	X	X	X			
CC20	Surface Water	X	X	X	X	X	X	X		

TABLE 3
Sample Container Types, Volumes, and Sample Preservation

Sample Matrix	Analysis	Analysis Mode	Required Detection Limits	Units	Container Number and Type[2]	Required Volume	Preservation	Analysis Time
Surface Water	Stable Water Isotopes-^2H	Duel inlet	NA	NA	1 - 30 mL glass or HDPE vial	2 mL minimum 15 mL preferred	None	4-6 weeks
Surface Water	Stable Water Isotopes-O	Duel inlet	NA	NA	1 - 30 mL glass or HDPE vial	2 mL minimum 15 mL preferred	None	4-6 weeks
Surface Water	Tritium (^3H)	Liquid scintillation	NA	TU	2 – 1 L glass or HDPE	1 L	None	2-4 weeks
Mine Water	Stable Water Isotopes-^2H	Duel inlet	NA	NA	1 - 30 mL glass or HDPE vial	2 mL minimum 15 mL preferred	None	4-6 weeks
Mine Water	Stable Water Isotopes-O	Duel inlet	NA	NA	1 - 30 mL glass or HDPE vial	2 mL minimum 15 mL preferred	None	4-6 weeks
Mine Water	Tritium (^3H)	Liquid scintillation	NA	TU	2 – 1 L glass or HDPE	1 L	None	2-4 weeks